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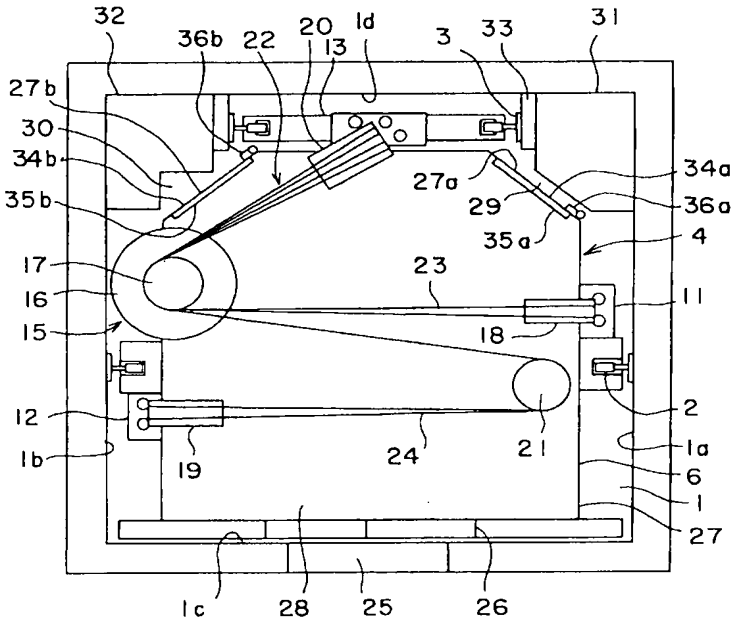
(54) ELEVATOR

(57) An elevator apparatus has a car wall formed in a polygonal plan configuration with five or more corners, whereby an installation space is provided between a hoistway wall and the car wall. In the installation space, at least one hoistway device, such as a main control panel for controlling a drive machine, is installed.

FIG. 2



EP 1 564 176 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator apparatus having a drive machine arranged in the upper portion in a hoistway.

BACKGROUND ART

[0002] In conventional machine-room-less type elevators, a drive machine and a control panel are arranged, for example, between a hoistway wall and a car. JP 10-139321 A, for example, discloses a machine-room-less type elevator in which a thin drive machine is arranged in the upper portion in the hoistway.

[0003] In the conventional machine-room-less type elevator as described above, since there is a need to dispose various devices in the hoistway, a planar area of the hoistway and an overhead dimension are increased. Thus, there is a demand for a further reduction in the size of the hoistway.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been made in view of the above problems . Therefore, it is an object of the present invention to provide an elevator apparatus simplified in construction and allowing a reduction in the hoistway size.

[0005] To this end, according to one aspect of the present invention, there is provided an elevator apparatus comprising: a hoistway having a hoistway wall; a car having a car floor, a tubular car wall arranged on the car floor and equipped with a car entrance, and a ceiling arranged on top of the car wall, and raised and lowered in the hoistway; and a plurality of hoistway devices arranged inside the hoistway, wherein the car wall is formed in a polygonal plan configuration with five or more corners to thereby provide an installation space between the hoistway wall and the car wall, and at least one hoistway devices is installed in the installation space.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Fig. 1 is a front view showing an elevator apparatus according to Embodiment 1 of the present invention;

Fig. 2 is a plan view showing a main portion of the elevator apparatus in Fig. 1;

Fig. 3 is a plan view showing a main portion of an elevator apparatus according to Embodiment 2 of the present invention;

Fig. 4 is a plan view showing a main portion of an elevator apparatus according to Embodiment 3 of the present invention;

Fig. 5 is an explanatory view showing a plane layout of an elevator apparatus according to Embodiment 4 of the present invention;

Fig. 6 is an explanatory view showing a plane layout of an elevator apparatus according to Embodiment 5 of the present invention; and

Fig. 7 is an explanatory view showing a plane layout of an elevator apparatus according to Embodiment 6 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0007] Preferred embodiments of the present invention will now be described with reference to the drawings.

Embodiment 1

[0008] Fig. 1 is a front view showing an elevator apparatus according to Embodiment 1 of the present invention, and Fig. 2 is a plan view showing a main portion of the elevator apparatus in Fig. 1.

[0009] In the drawings, installed in a hoistway 1 are a pair of car guide rails 2 and a pair of counterweight guide rails 3. A car 4 is guided by the car guide rails 2 to be raised and lowered in the hoistway 1. The car 4 has a car frame 5 and a cage 6 supported by the car frame 5. The car frame 5 has a pair of vertical frames 7, a lower frame 8 secured between the lower ends of the vertical frames 7 and supporting the cage 6, and an upper frame 9 secured between the upper ends of the vertical frames 7.

[0010] The lower frame 8 is equipped with first and second main rope connecting portions 11 and 12. The first and second main rope connecting portions 11 and 12 are arranged symmetrically with respect to the center of gravity of the car 4.

[0011] A counterweight 13 is guided by the counterweight guide rails 3 to be raised and lowered in the hoistway 1. Further, the counterweight 13 is arranged behind the car 4 as seen from the landing side.

[0012] A mounting frame 14 (omitted in Fig. 2) is arranged in the upper portion of the hoistway 1. The mounting frame 14 is fixed to the upper end portions of the car guide rails 2 and the counterweight guide rails 3. Mounted on the mounting frame 14 is a drive machine (hoisting machine) for causing the car 4 and the counterweight 13 to be raised and lowered.

[0013] The drive machine 15 has a drive machine main body 16 and a driving sheave 17 rotated by the drive machine main body 16. Further, the drive machine 15 is arranged horizontally so that the rotation shaft of the driving sheave 17 may extend vertically. The drive machine main body 16 has a thin motor whose axial dimension is smaller than the diameter thereof.

[0014] Mounted on the mounting frame 14 are first and second car side return pulleys 18 and 19, a coun-

terweight side return pulley 20, and a direction change pulley 21. The first car side return pulley 18 is arranged above the first main rope connecting portion 11 such that its rotation shaft extends horizontally in the depth direction of the car 4 (the vertical direction in Fig. 2). The second car side return pulley 19 is arranged above the second main rope connecting portion 12 such that its rotation shaft extends horizontally in the depth direction of the car 4 (the vertical direction in Fig. 2).

[0015] The counterweight side return pulley 20 is arranged above the counterweight 13 such that its rotation shaft extends horizontally. Further, the drive machine 15, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, and the direction change pulley 21 are arranged above the car 4 so as to overlap the car 4 in a vertical plane of projection.

[0016] Wrapped around the driving sheave 17 is a main rope group 22 for suspending the car 4 and the counterweight 13 in the hoistway 1. The main rope group 22 has a plurality of first main ropes 23 and a plurality of second main ropes 24. Here, the number of first main ropes 23 is the same as the number of second main ropes 24.

[0017] Further, the first and second main ropes 23 and 24 consist, for example, of highly flexible composite material ropes with resin coating, whereby it is possible to achieve a reduction in diameter for the driving sheave 17, the first and second car side return pulleys 18 and 19, the counterweight side return pulley 20, and the direction change pulley 21.

[0018] The first main ropes 23 have first end portions connected to the first main rope connecting portion 11 and second end portions connected to the upper portion of the counterweight 13. The second main ropes 24 have first end portions connected to the main rope connecting portion 12 and second end portions connected to the upper portion of the counterweight 13.

[0019] Starting with their first ends, the first main ropes 23 are successively wrapped around the first car side return pulley 18, the driving sheave 17, and the counterweight side return pulley 20 in that order to end in their second end portions. Starting with their first ends, the second main ropes 24 are successively wrapped around the second car side return pulley 19, the direction change pulley 21, the driving sheave 17, and the counterweight side return pulley 20 in that order to end in their second end portions.

[0020] That is, the first main ropes 23 and the second main ropes 24 connected to the counterweight 13 bifurcated in two directions by the driving sheave 17 before being connected to the car 4.

[0021] The direction change pulley 21, which is arranged substantially horizontally, has its rotation shaft somewhat inclined with respect to the vertical direction so as to make the approach angle of the second main ropes 24 as small as possible.

[0022] Further, the hoistway 1 has first and second hoistway walls 1a and 1b opposed to each other, a third hoistway wall 1c in which a landing entrance 25 is provided, the third hoistway wall 1c, and a fourth hoistway wall 1d opposed to the back surface of the car 4.

[0023] A car 6 has a car floor (not shown), a car wall 27 which is arranged on the car floor and equipped with a car entrance 26, and a ceiling 28 arranged on top of the car wall 27.

[0024] The car wall 27 has a hexagonal plan configuration, whereby first and second installation spaces 29 and 30 are provided between thehoistwaywalls 1a, 1b, 1d, and the carwall 27. More specifically, the car wall 27 is formed as a tube with a square sectional configuration, and adjacent corner portions thereof are beveled to form inclined surfaces 27a and 27b. The inclined surfaces 27a and 27b are inclined with respect to the hoistway walls 1a and 1b. The installation spaces 29 and 30 are provided between the inclined surfaces 27a and 27b and the hoistway walls 1a, 1b, and 1d.

[0025] In a first installation space 29, a main control panel 31 as a hoistway device is installed. In a second installation place 30, a sub control panel 32 as a hoistway device is installed. A main control panel 31 and a sub control panel 32 control the drive machine and other apparatuses.

[0026] Further, the main control panel 31 and the sub control panel 32 are arranged at positions where they are opposed to the inclined surfaces 27a and 27b of the car wall 27 when the car 6 is situated on the uppermost floor. Further, the main control panel 31 and the sub control panel 32 are supported by a plurality of rail brackets 33 supporting the counterweight guide rails 3 with respect to the hoistway wall 1d.

[0027] The inclined surfaces 27a and 27b are provided with inspection windows 34a and 34b facing the installation spaces 29 and 30 and covers 35a and 35b for opening and closing the inspection windows 34a and 34b from within the car 6.

[0028] Further, the car wall 27 is equipped with cover switches 36a and 36b for detecting the opening and closing of the covers 35a and 35b. When the covers 35a and 35b are opened, the ascent and descent of the car 4 is prevented.

[0029] In this elevator apparatus, due to the hexagonal plan configuration of the car wall 27, the first and second installation spaces 29 and 30 are secured between the hoistway walls 1a, 1b, 1d and the car wall 27, and the main control panel 31 and the sub control panel 32 are arranged in the first and second installation spaces 29 and 30, whereby the hoistway 1 can be made compact.

[0030] Further, the first and second installation spaces 29 and 30 are secured over the entire raising and lowering traveling distance for the car 4, so that the main control panel 31 and the sub control panel 32 can be increased in size, and these installation spaces allow installation of all manner of hoistway devices, whereby it is possible to achieve space saving for elevator apparatuses of both small and large volume.

[0031] Further, due to the configuration of the car wall 27, which is realized by beveling corner portions of a tube that is square in section, it is possible to prevent a deterioration in terms of design, and to utilize the space in the hoistway 1 more effectively.

[0032] Furthermore, since the car wall 27 is equipped with the inspection windows 34a and 34b facing the installation spaces 29 and 30 and the covers 35a and 35b for opening and closing the inspection windows 34a and 34b, it is possible for the operator to conduct maintenance operation on the apparatuses installed in the installation spaces 29 and 30 from within the car 6, thereby achieving an improvement in terms of operability.

[0033] Further, since the cover switches 36a and 36b are used to detect the opening and closing of the covers 35a and 35b, and the ascent and descent of the car 4 is prohibited when the covers 35a and 35b are opened, it is possible to achieve an improvement in terms of operational safety for maintenance.

[0034] Further, since the drive machine 15 is arranged in the upper portion of the interior of the hoistway 1, and the main control panel 31 for controlling the driving machine 15 is arranged on the uppermost floor, it is possible to diminish the distance between the drive machine 15 and the main control panel 31, whereby the control signal is protected from noise, thus achieving an improvement in terms of reliability.

Embodiment 2

[0035] Next, Fig. 3 is a plan view showing a main portion of an elevator apparatus according to Embodiment 2 of the present invention. In this embodiment, the car wall 27 is formed by beveling the four corner portions of a tube that is square in section, forming inclined surfaces 27a through 27d, that is, the car wall 27 is formed as a tube with an octagonal sectional configuration. A first installation space 29 is provided between the inclined surface 27a and the hoistway walls 1a and 1d. Further, a third installation space 41 is provided between the inclined surface 27c and the hoistway walls 1b and 1c.

[0036] The inclined surfaces 27a and 27c are respectively equipped with inspection windows 34a and 34c and covers 35a and 35c. In the first installation space 29, a main control panel 31 is installed. In the third installation space 41, a sub control panel 32 is installed. The sub control panel 32 is fixed to the hoistway wall 1b.

[0037] The side surface of the car wall 27 has an inspection window 34e for performing maintenance on the sub control panel 32 from within the car 6, and a cover 35e for opening and closing the inspection window 34e from within the car 6.

[0038] The lower frame 8 of the car 4 is equipped with first and second main rope connecting portions 11 and 12. More specifically, the first and second main rope connecting portions 11 and 12 are arranged outside the inclined surfaces 27b and 27d. The first and second main rope connecting portions 11 and 12 are arranged symmetrically with respect to the center of gravity of the car 4.

[0039] The inclined surfaces 27b and 27d are respectively equipped with inspection windows 34b and 34d facing the main rope connecting portions 11 and 12, and covers 35b and 35d for opening and closing the inspection windows 34b and 34d.

[0040] Starting with their first ends, first main ropes 23 are successively wrapped around a first car side return pulley 18, a direction change pulley 21, a driving sheave 17, and a counterweight side return pulley 20 in that order to end in their second end portions. Starting with their first ends, second main ropes 24 are successively wrapped around a second car side return pulley 19, the driving sheave 17, and the counterweight side return pulley 20 in that order to end in their second end portions.

[0041] In this elevator apparatus, the car wall 27 is octagonal in plan configuration, whereby the first and third installation spaces 29 and 41 are secured between the hoistway walls 1a through 1d and the car wall 27. Further, since the main control panel 31 and the sub control panel 32 are respectively arranged in the first and third installation spaces 29 and 41, it is possible to make the hoistway 1 compact.

[0042] Further, due to the configuration of the car wall 27, which is realized by beveling the four corner portions of a tube that is square in section, it is possible to achieve an improvement in terms of design, and to utilize the space in the hoistway 1 more effectively.

[0043] Further, since the main rope connecting portions 11 and 12 are arranged on the outer side of the diagonally situated inclined surfaces 27b and 27d of the car 6, it is possible to utilize the space in the hoistway 1 still more effectively.

[0044] Furthermore, since the inspection windows 34b and 34d facing the main rope connecting portions 11 and 12 are provided in the inclined surfaces 27b and 27d, it is possible to perform maintenance on the main rope connecting portions 11 and 12 from within the car 6, thereby achieving an improvement in terms of operability and safety.

Embodiment 3

[0045] Next, Fig . 4 is a plan view showing a main portion of an elevator apparatus according to Embodiment 3 of the present invention. While in Embodiments 1 and 2 a counterweight 13 is arranged behind the car 4 as seen from a landing side, in Embodiment 3, the counterweight 13 is arranged on the side of the car 4 so as to be opposed to one side surface of the car 6. The car wall 27 is formed by beveling three corner portions of a tube that is square in section, forming the inclined surfaces 27a, 27b, and 27d, that is, as a tubular member with a heptagonal sectional configuration. Between the inclined surface 27a and the hoistway walls 1a and 1d, a first installation space 29 is provided. Otherwise, this

embodiment is of the same construction as the Embodiments 1 and 2.

[0046] In this way, even with the elevator apparatus in which the counterweight 13 is arranged by the side of the car 4, it is possible to form the car wall 27 in the polygonal plan configuration with five or more corners to secure the installation space 29, installing the main control panel 31 in the installation space 29, so that it is possible to make the hoistway 1 compact.

Embodiment 4

[0047] Next, Fig . 5 is an explanatory view showing a plan layout of an elevator apparatus according to Embodiment 4 of the present invention. While Embodiments 1 through 3 have been described as applied to a single elevator apparatus, the present invention is also applicable to a case in which a plurality of elevator apparatuses are installed side by side as shown in Fig. 5. In this case, an installation space 42 is arranged between the two cars 27, whereby it is possible to effectively utilize the interior of the hoistway 1 and to secure a still larger installation space 42.

Embodiment 5

[0048] Next, Fig. 6 is an explanatory view showing a plan layout of an elevator apparatus according to Embodiment 5 of the present invention. While in Embodiments 1 through 4 the car wall 27 is formed by beveling at least one corner portion of a tube that is square in section to form the inclined surfaces 27a through 27d, it is also possible, as shown in Fig. 6, to realize a sectional configuration in which a recess 27e is provided in a part of a side of a square. In this arrangement also, it is possible to secure an installation space 43 between the hoistway walls 1a and 1d and the recess 27e.

Embodiment 6

[0049] Next, Fig . 7 is an explanatory view showing a plan layout of an elevator apparatus according to Embodiment 6 of the present invention. While in Embodiments 1 through 4 the car wall 27 is provided with planar inclined surfaces 27a through 27d, it is also possible, as shown, for example, in Fig. 7, to provide the car wall 27 with a curved surface 27f opposed to an installation space 44.

[0050] The plan configuration of the car may also be a polygon with nine or more corners. In other words, it is only necessary for the car wall to be a tubular polyhedron with five or more faces.

[0051] Further, while in the above embodiments the main control panel 31 and the sub control panel 32 constitute the hoistway devices to be installed, it is also possible to install other hoistway devices in the installation space. Examples of other hoistway devices include such as a transformer, a battery (battery charger), and a remote control apparatus (monitoring panel).

[0052] Here, the remote control apparatus consists of a monitoring panel for outputting a remote control signal to a remotely situated control room. Since in many cases the remote control apparatus is optionally installed, it has been rather difficult to secure the installation space for it. According to the present invention, however, the installation space extends substantially over the entire ascending/descending distance for the car, the remote control apparatus can be easily installed.

[0053] Further, it is also possible to install a drive machine for raising and lowering the car in the installation space as a hoistway device.

[0054] Furthermore, while the above embodiments have been described as applied to an elevator apparatus of a 1:1 roping system, there are no particular limitations regarding the roping system. For example, the present invention is also applicable to an elevator apparatus of a 2:1 roping system.

Claims

1. An elevator apparatus comprising:

   a hoistway having a hoistway wall;
   a car having a car floor, a tubular car wall arranged on the car floor and equipped with a car entrance, and a ceiling arranged on top of the car wall, and raised and lowered in the hoistway; and
   a plurality of hoistway devices arranged inside the hoistway,

   wherein the car wall is formed in a polygonal plan configuration with five or more corners to thereby provide an installation space between the hoistway wall and the car wall, and at least one hoistway devices is installed in the installation space.

2. An elevator apparatus according to Claim 1, wherein the car wall consists of a tubular member square in section with at least one corner portion thereof beveled to form an inclined surface, and wherein the installation space is provided between the inclined surface and the hoistway wall.

3. An elevator apparatus according to Claim 1, wherein the car wall is equipped with an inspection window facing the installation space and a cover for opening and closing the inspection window.

4. An elevator apparatus according to Claim 3, further comprising a cover switch for detecting the opening and closing of the cover, wherein a raising and lowering operation of the car is prohibited when the cover is opened.

5. An elevator apparatus according to Claim 1, further comprising a drive machine arranged in an upper portion of the interior of the hoistway for raising and lowering the car, wherein the hoistway devices include a control panel for controlling the drive machine, with the control panel being situated so as to be opposed to the car wall when the car is on the uppermost floor.

FIG. 1

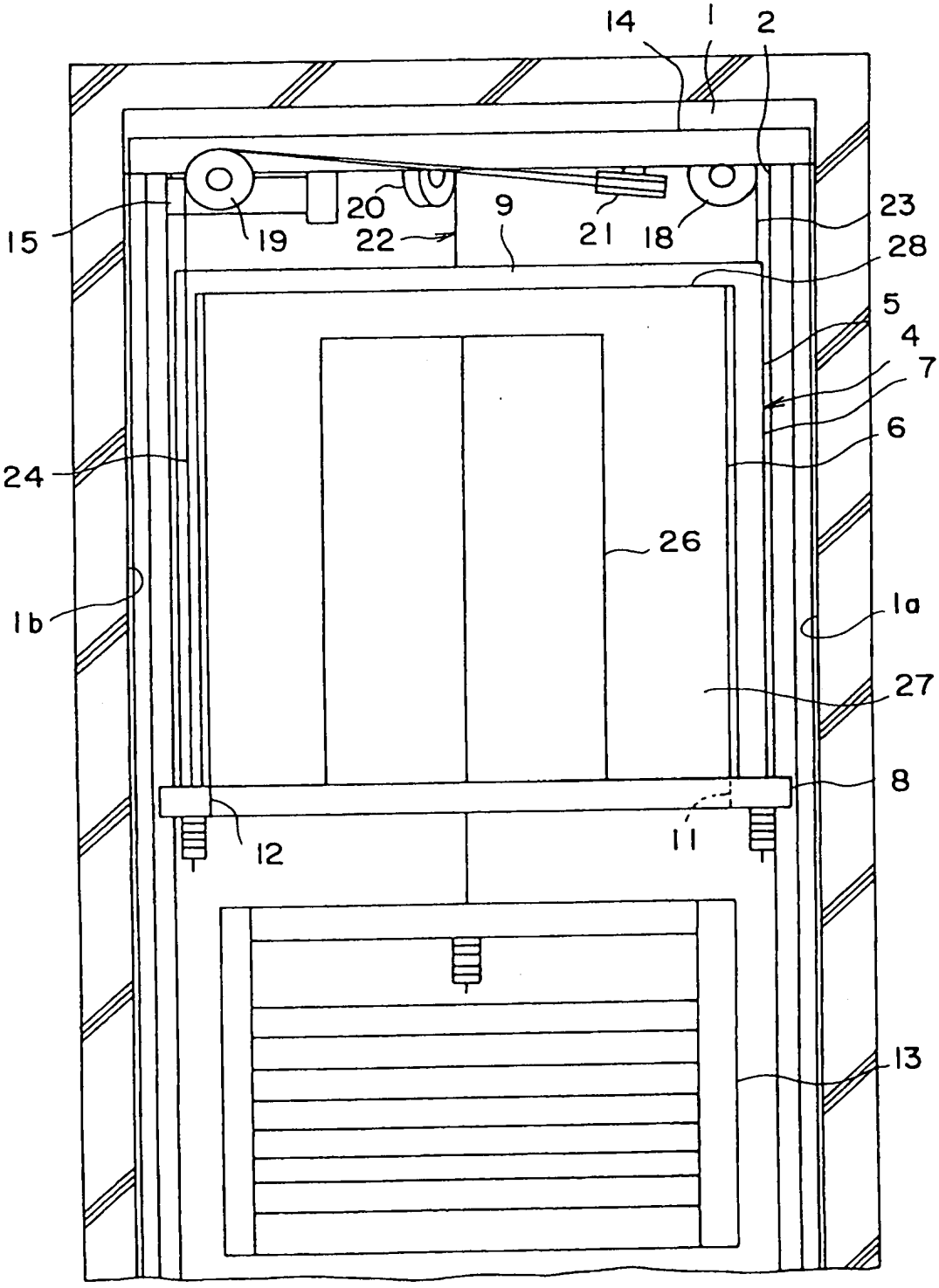


FIG. 2

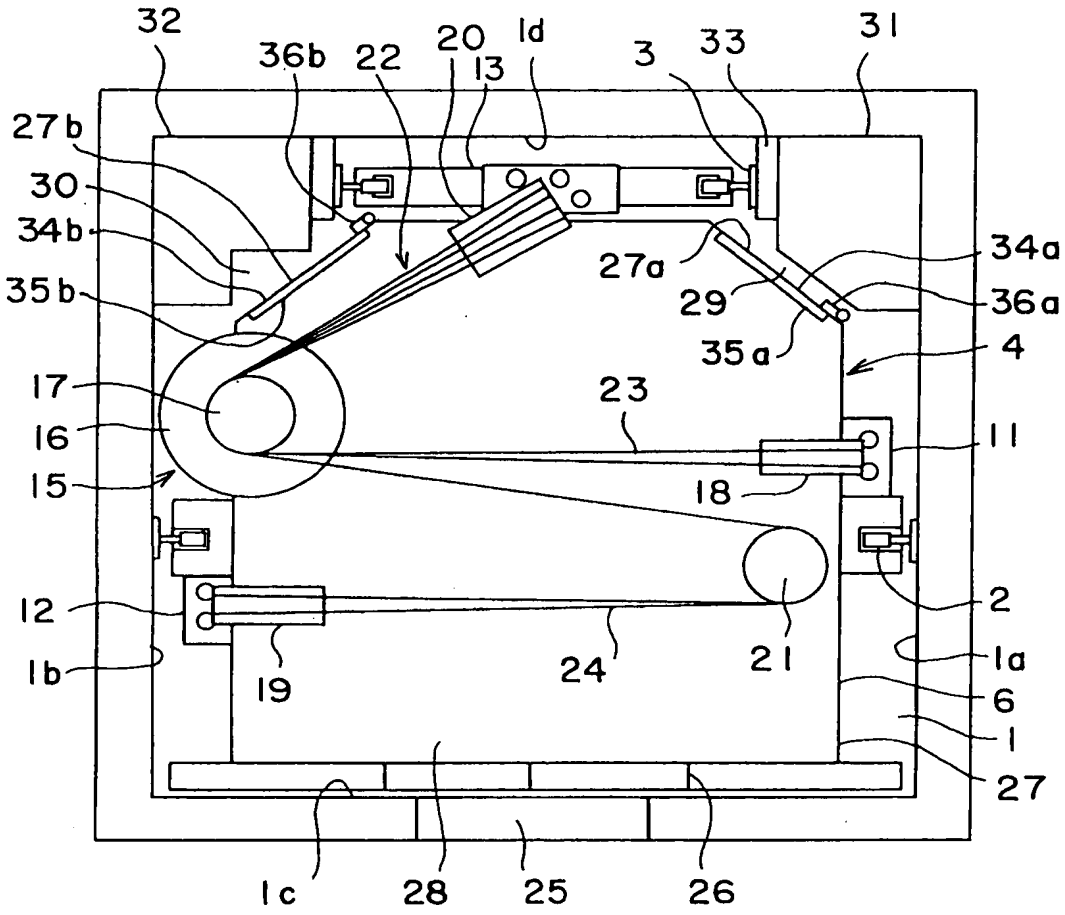

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FIG. 3

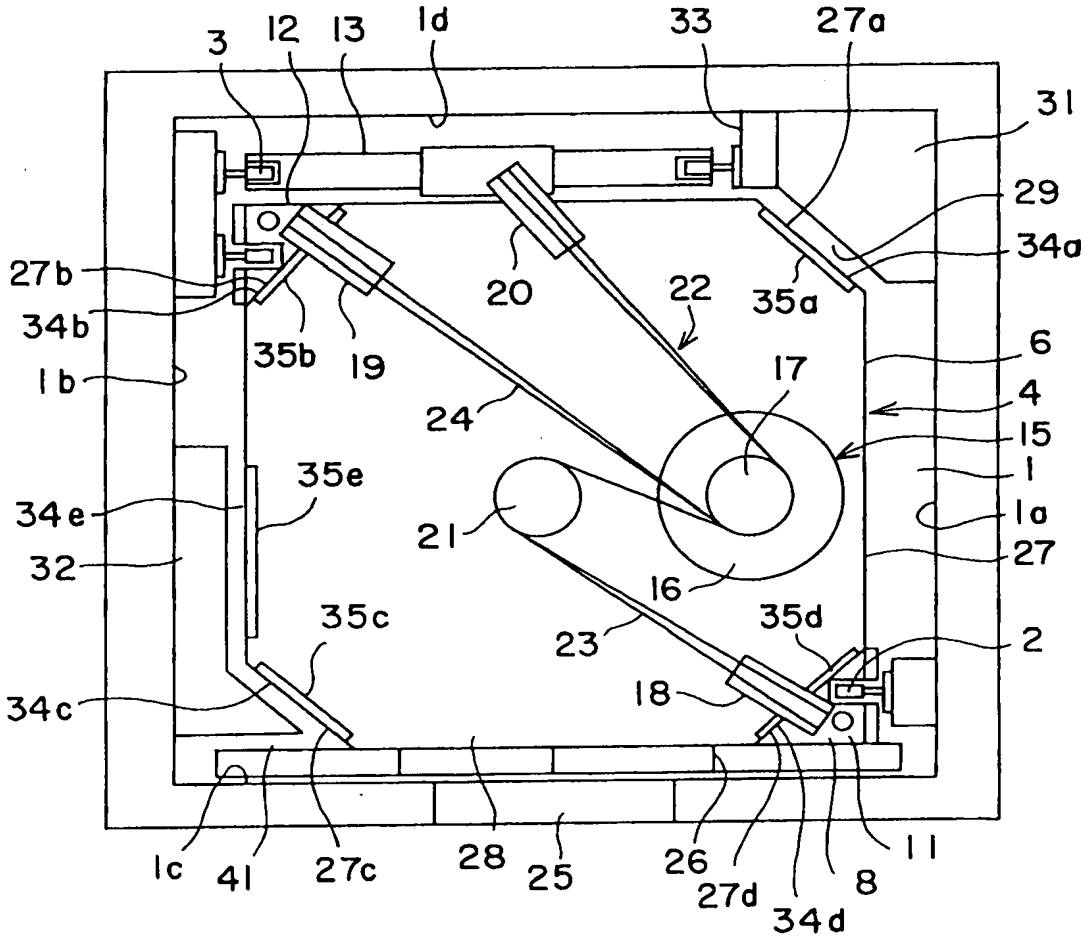
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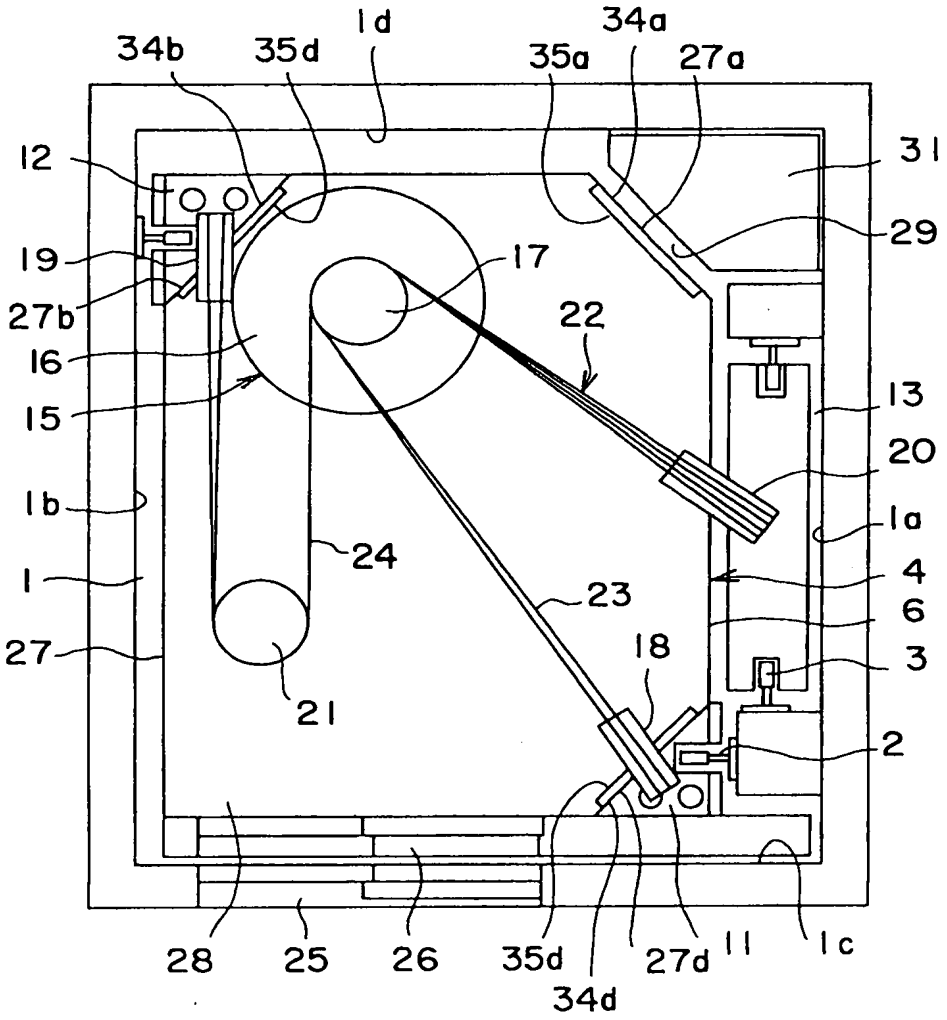
FIG. 4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35d
27d
11
1c
34d

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/04271

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B1/34, 7/00, 11/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B66B1/00-11/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 4-89787 A (Mitsubishi Electric Corp.), 23 March, 1992 (23.03.92), (Family: none)	1-2 3-5
Y	JP 2000-247560 A (Mitsubishi Electric Corp.), 12 September, 2000 (12.09.00), & EP 1031528 A1 & CN 1264678 A	3-4
Y	JP 2000-238971 A (Hitachi Building Systems Co., Ltd.), 05 September, 2000 (05.09.00), (Family: none)	5
A	JP 2001-253659 A (Mitsubishi Electric Corp.), 18 September, 2001 (18.09.01), (Family: none)	1-2

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search 21 January, 2003 (21.01.03)	Date of mailing of the international search report 04 February, 2003 (04.02.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/04271

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001-106461 A (Matsushita Electric Works, Ltd.), 17 April, 2001 (17.04.01), (Family: none)	1,5
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Form PCT/ISA/210 (continuation of second sheet) (July 1998)

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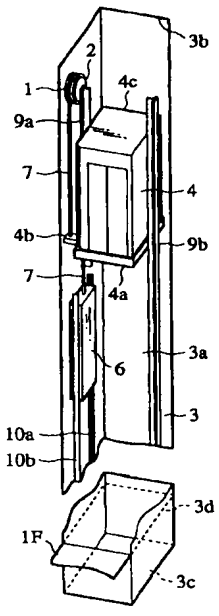
(54) Traction type elevator

(57) An elevator apparatus is provided with an elevator path having a restricted height. Under a roping ratio of 1 : 1, a thin driving unit having a traction sheave 1 and a driving mechanism 2 is positioned between an inner wall 3a of the elevator path 3 and a space occupied by an elevator car 4 rising and falling in the elevator path 3. One end of a suspension rope 7 is fixed to the elevator car 4 in a position below a ceiling 4c of the elevator car 4. With the arrangement, the car 4 can move close to the ceiling 4c of the elevator car 4 effectively. Further, it is possible to reduce respective heights of the elevator path 3 and a building equipped with the elevator apparatus.

FIG.3



EP 0 953 538 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an improvement of a traction type of elevator apparatus having a driving mechanism disposed in an elevator path (or hoistway) of the apparatus.

2. Description of Related Art

[0002] In recent years, especially in urban areas, it has been required to make the effective use of buildings per se. For example, for even an elevator's machine room standing on the housetop etc., the right to sunlight, the appearance of beauty, or the like have been taken into consideration.

[0003] Under such a situation, hitherto, there have been developed a variety of attempts to accommodate a control unit in the elevator path without establishing the elevator's machine room in order to provide a compact elevator apparatus. For example, Japanese Patent No. 2593288 discloses a traction sheave elevator, as shown in Fig. 1. In the figure, a flattened driving mechanism 2 having a traction sheave 1 is disposed between a side wall 3a in an elevator path 3 and a space defined by projected planes of an elevator car 4 in the upward and downward directions. A hoisting (suspension) rope 7 is wound about a sheave 5a beneath the car 4 and a sheave 5b above a balance weight 6, while both ends of the hoisting rope 7 are fixed on a top wall 3b defining the elevator path 3. Note, according to the arrangement shown in Fig. 1, a pit 3c in the elevator path 3 is positioned under a level 3d of the first floor (1F).

[0004] The elevator of Fig. 1 does adopt a structure where the car 4 is driven like a movable pulley while winding the suspension rope 7 about the sheave 5a under the car 4. Owing to this arrangement, it is possible to reduce the capacity of a motor of the driving mechanism relatively and minimize a space occupied by the driving mechanism, together with the effective use of the space above the car 4.

[0005] Japanese Unexamined Patent Publication (kokai) No. 9-156855 discloses another elevator apparatus shown in Fig. 2. In the apparatus, the flattened driving mechanism 2 is arranged in the upper space of the balance weight 6 and adapted so as to suspend the car 4 through turning sheaves 8a, 8b and 8c.

[0006] In this way, since the driving mechanism 2 having the traction sheave 1 is disposed between a side wall 3a in an elevator path 3 and a space defined by projected planes of an elevator car 4 in the upward and downward directions, the arrangement allows to minimize a space that the whole apparatus does occupy without providing the machine room on the roof, so that the elevator apparatus can be provided while exhibiting high efficiency in utilizing the space.

[0007] In the former elevator apparatus, however, since the velocity of the moving rope is twice as much as that of the elevator car due to the adoption of "moving-pulley" driving system in accordance with the roping ratio of 2 : 1, various problems would be raised in case of the requirement for a high-speed elevator. In addition, as the driving mechanism is accommodated in the space between the projected planes of the elevator car and the inner wall of the elevator path, a problem still remains in terms of the requirements for the mechanism having a large capacity.

[0008] While, in the latter elevator apparatus, the velocity of the suspending rope is equal to that of the elevator car owing to the provision of the turning sheaves. Nevertheless, there is remained a problem in terms of effective use of space in the elevator path because the apparatus requires a space for accommodating the turning sheaves on the upper side of the elevator path.

SUMMARY OF THE INVENTION

[0009] It is therefore an object of the present invention to provide an elevator apparatus which is equipped with no machine room, so that it is possible to restrict the height of an elevator path from increasing and also drive an elevator car at high speed.

[0010] The object of the present invention described above can be accomplished by an elevator apparatus comprising:

a pair of elevator guide rails disposed in an elevator path;
an elevator car for rising and falling along the elevator guide rails in the elevator path;
weight guide rails disposed in an elevator path;
at least one balance weight for rising and falling along the weight guide rails in the elevator path;
at least one suspension rope having one end fixed to the elevator car and another end fixed to the balance weight; and
at least one driving unit for driving a traction sheave about which the suspension rope is wound;
wherein the driving unit is positioned between an inner wall of the elevator path and a space occupied by the elevator car rising and falling in the elevator path and the driving unit is constructed so as to become thin; and
wherein the end of the suspension rope is fixed to the elevator car in a position below a ceiling of the elevator car.

[0011] According to the elevator apparatus constructed above, the drive of the elevator car at the same speed as the suspension rope can be realized owing to the achievement of roping ratio of 1 : 1. In addition, with the arrangement where the elevator car is connected